

Amendments to and listing of the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An optical signal to electrical signal converter comprising:
an optical waveguide for receiving and propagating a modulated an optical signal that has been modulated so as to have a side band represented by:

$$\lambda_{sb} = \lambda_c + \Delta\lambda$$

$$\Delta\lambda = \lambda_c - (C\lambda_c/(C+f_m\pi)) = f_m\lambda_c^2/(C+f_m\lambda_c)$$

where f_m is the frequency in Hertz (Hz) of the modulating signal, λ_{sb} is a wavelength at which the side band generates, C is the velocity of light, and λ_c is the center frequency of the light; and

a pair of electrodes disposed within a region where an electric field applies, said electric field being generated in the optical waveguide by a nonlinear optical effect when the optical signal propagates through the optical waveguide,

wherein the optical waveguide is formed on a dielectric substrate or in the dielectric substrate, and

wherein the pair of electrodes are provided on a top surface of the dielectric substrate, said pair of electrodes being opposite to each other sandwiching the optical waveguide, thereby detecting changes of the electric field with the optical waveguide interposed between the electrodes.

wherein the optical signal is incident on a side surface of the dielectric substrate parallel to the longitudinal direction of the pair of electrodes, and

wherein when the optical signal is incident on the side surface of the dielectric substrate, a variation in the electric field generated in the optical waveguide is output as an electrical signal from the pair of electrodes.

2. (Currently Amended) An optical signal to electrical signal converter according to claim 1, further comprising a resonator coupled to the pair of electrodes, the resonator being capable of being configured to be excited by an electrical signal induced at the pair of electrodes by the electric field.

3. (Cancelled)

4. (Cancelled)

5. (Previously Presented) An optical signal to electrical signal converter according to claim 1, wherein at least a portion of the optical waveguide and at least a portion of the dielectric substrate are formed from a nonlinear optical material, and the electric field is generated by a differential frequency generation when the optical signal propagates through the optical waveguide.

6. (Original) An optical signal to electrical signal converter according to claim 5, further comprising an electromagnetic wave radiating device coupled to the resonator, wherein the optical signal to electrical signal converter radiates the electrical signal as a radio signal.

7. (Currently Amended) An optical signal to electrical signal converter according to claim [[1]] 2, wherein the resonator and the electromagnetic wave radiating device are integrated with the substrate.

8. (Original) An optical signal to electrical signal converter according to claim 7, wherein the resonator and the electrodes are connected by micro strip lines formed on the dielectric substrate.

9. (Currently Amended) An optical signal to electrical signal converter according to claim 1, wherein [[the]] a modulation frequency of the optical signal is 10GHz or higher.

10. (Original) An optical signal to electrical signal converter according to claim 1, further comprising a light beam input portion coupled to the optical waveguide.

11. (Original) An optical signal to electrical signal converter according to claim 5, wherein the nonlinear optical material is a material selected from a group consisting of lithium niobate (LiNbO₃), lithium tantalate (LiTaO₃)-based material, potassium titanyl phosphate (KTiOPO₄)-based material, rare earth-calcium oxyborate (RECa₄O(BO₃)₃, RE: a Rare Earth element)-based material, DAST (4-dimethylamino-N-methyl-4-stilbazorium- toxyrate) and 3RDCVXY (dicyanovinyl termination-dimethyl substitution-diazo).

12. (Previously Presented) An optical signal to electrical signal converter according to claim 1, wherein the optical waveguide has a periodic polarization inversion structure where the polarization

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direction is inverted periodically along the optical waveguide.

13. (Original) An optical signal to electrical signal converter according to claim 1, further comprising a resistor connecting electrically the pair of electrodes with each other.

14. (Previously Presented) An optical signal to electrical signal converter according to claim 1, further comprising a housing accommodating the dielectric substrate.